Tidally Correcting Fisheries Data

Tidal aliasing and other bad things that can happen when data are collected irrespective of the tides

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The Delta is incredibly dynamic

Pelagic organisms are almost always in motion

What does this imply for fisheries data analysis?

Outline

Background:
Tides, tidal currents and tidal excursions

Pelagic organisms are always in motion
and can travel long distances

Regions within the Delta
may not be distinct habitats

Outline con't

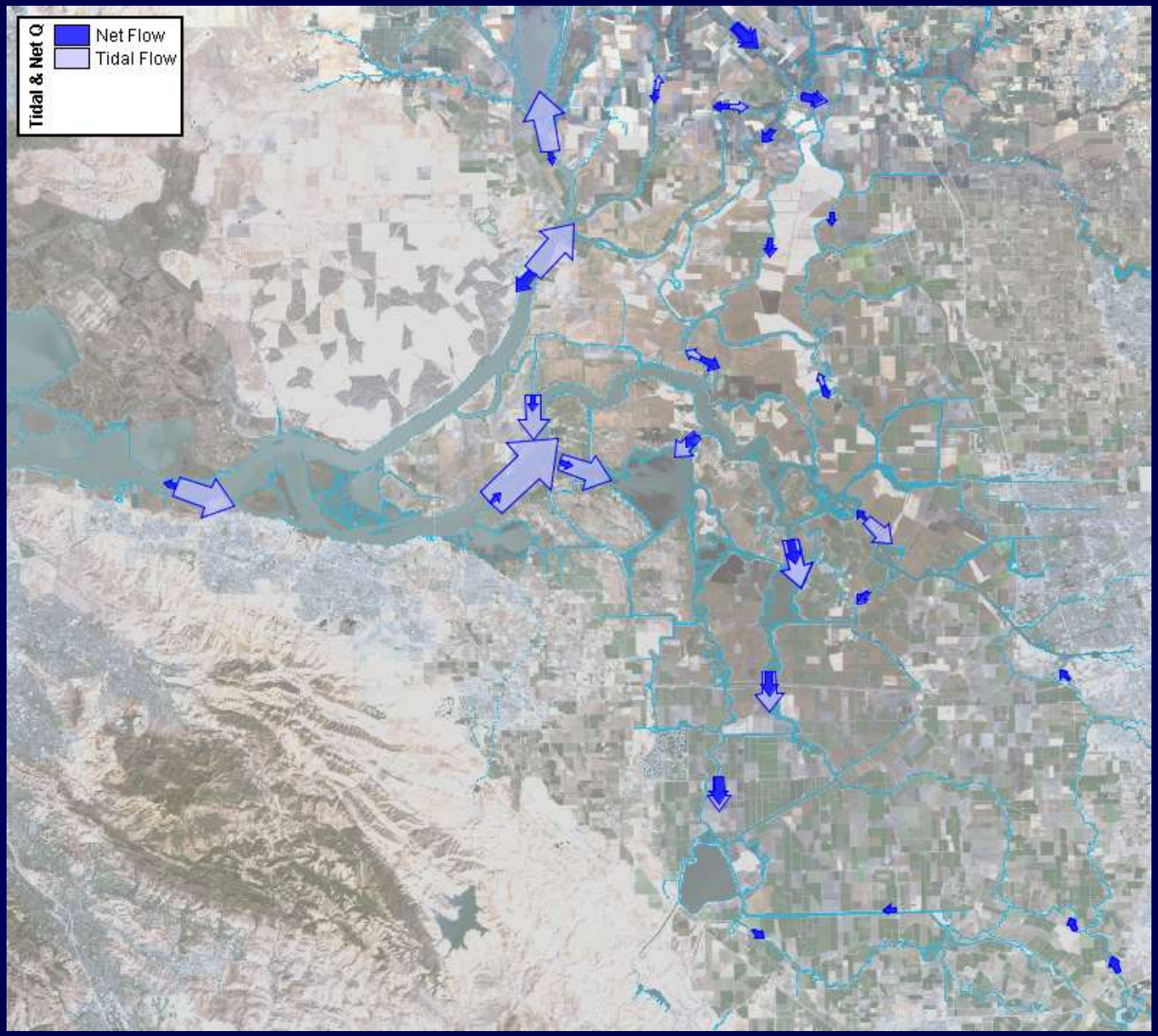
Correcting for the tides
(a) Using tidal currents to infer spatial structure
(b) Correlating fisheries data
with tidal current phase

Outline con't

The problem: Tidal aliasing

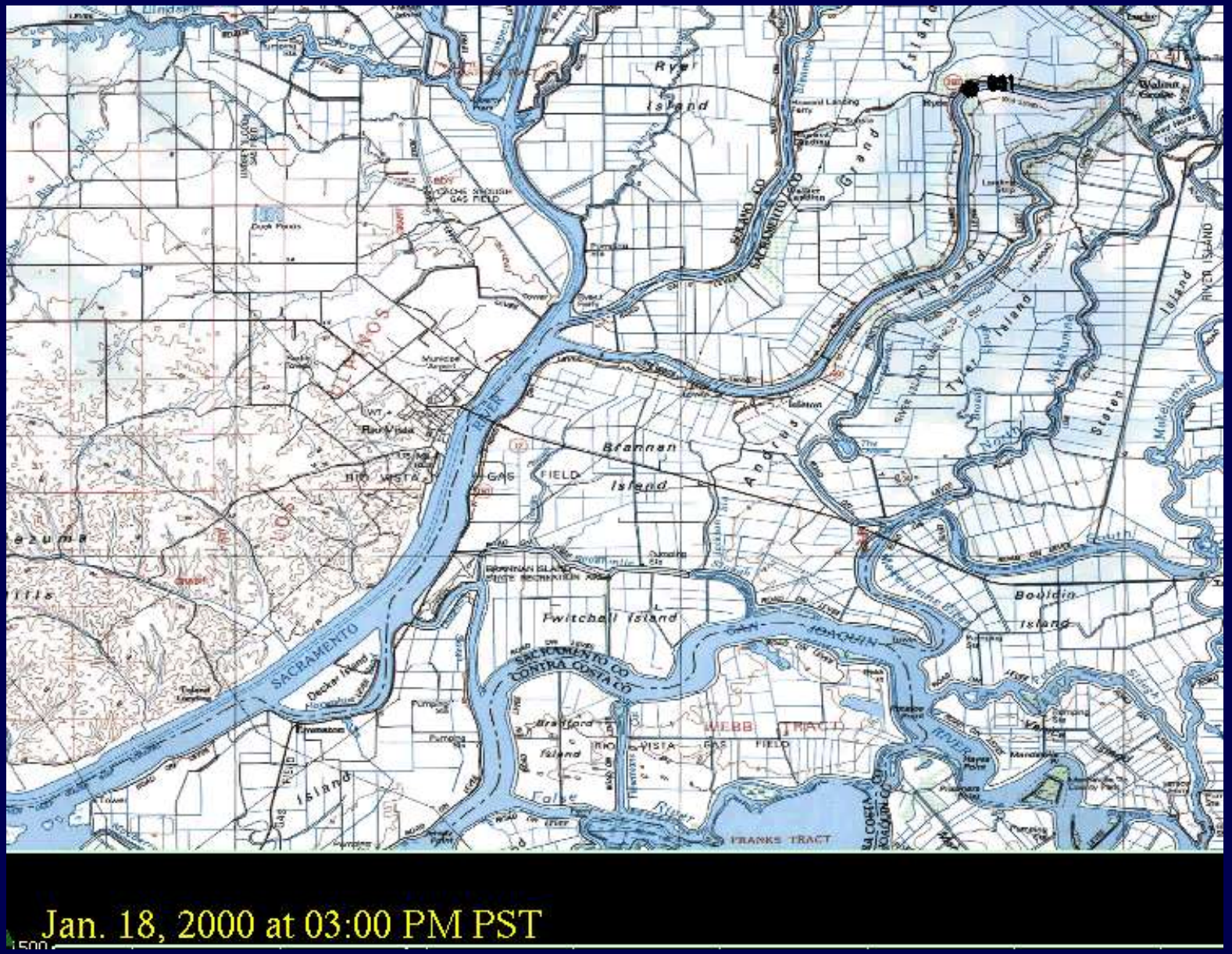
Possible solution: Change monitoring programs so that samples are taken adjacent to fixed stations at a particular phase of the tide

Tidal vs Net Flows



Courtesy of RMA

Radio Tagged Salmon Movements



Courtesy of Vogel

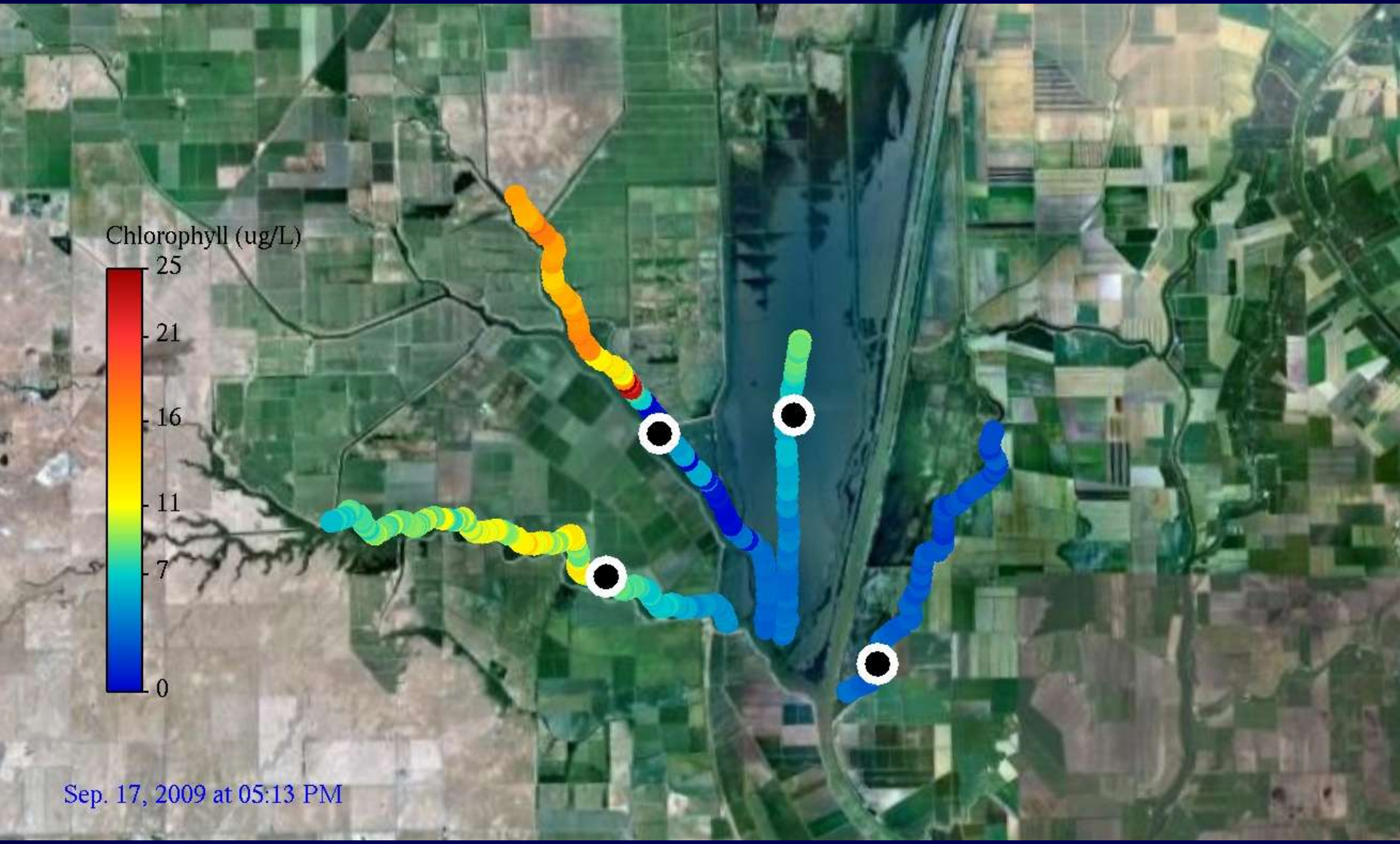
Radio Tagged Salmon Movements

Courtesy of Vogel

Unique Habitats?

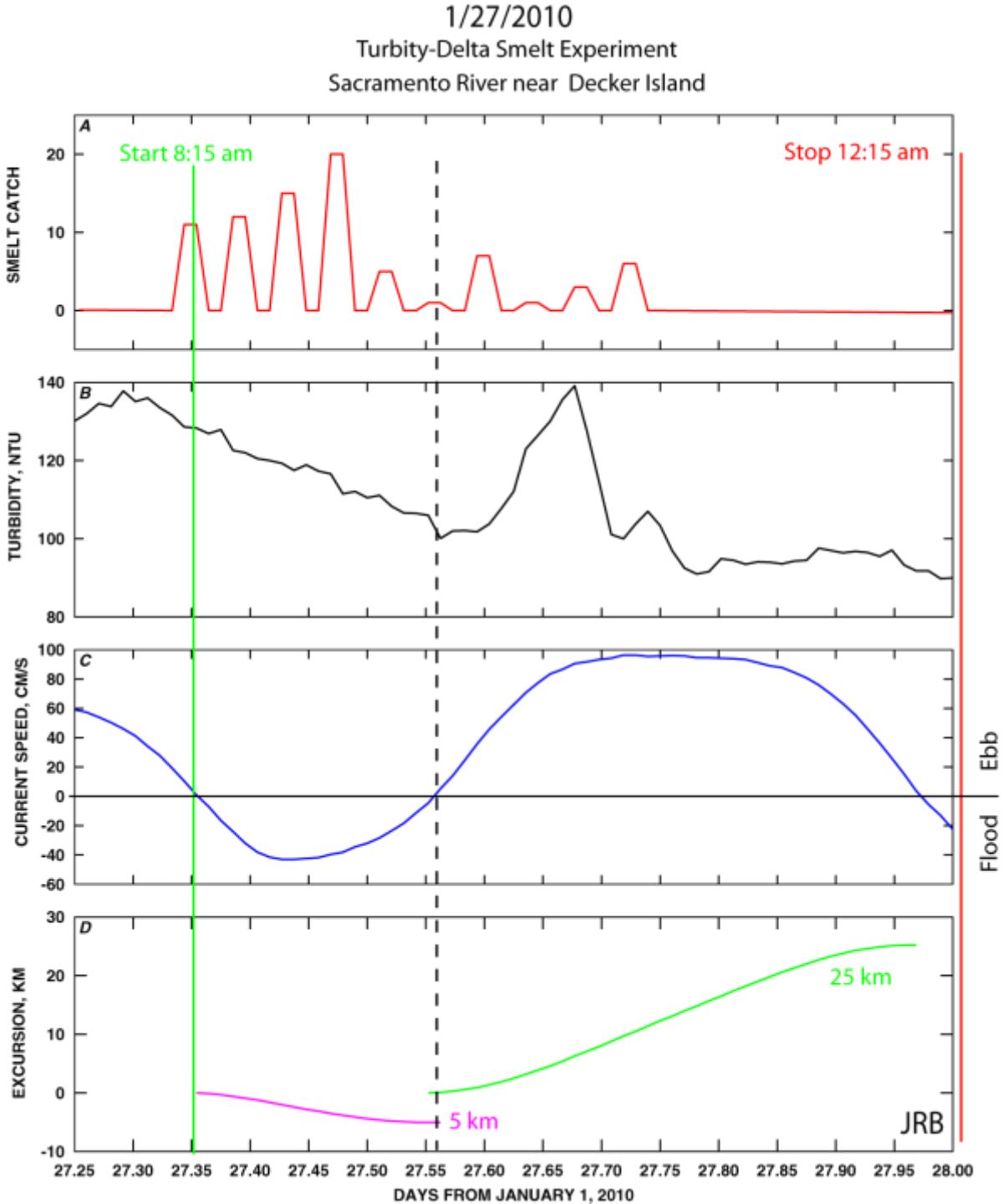
Liberty Island Flood/Ebb Excursions

Liberty Island Chl-a Distributions

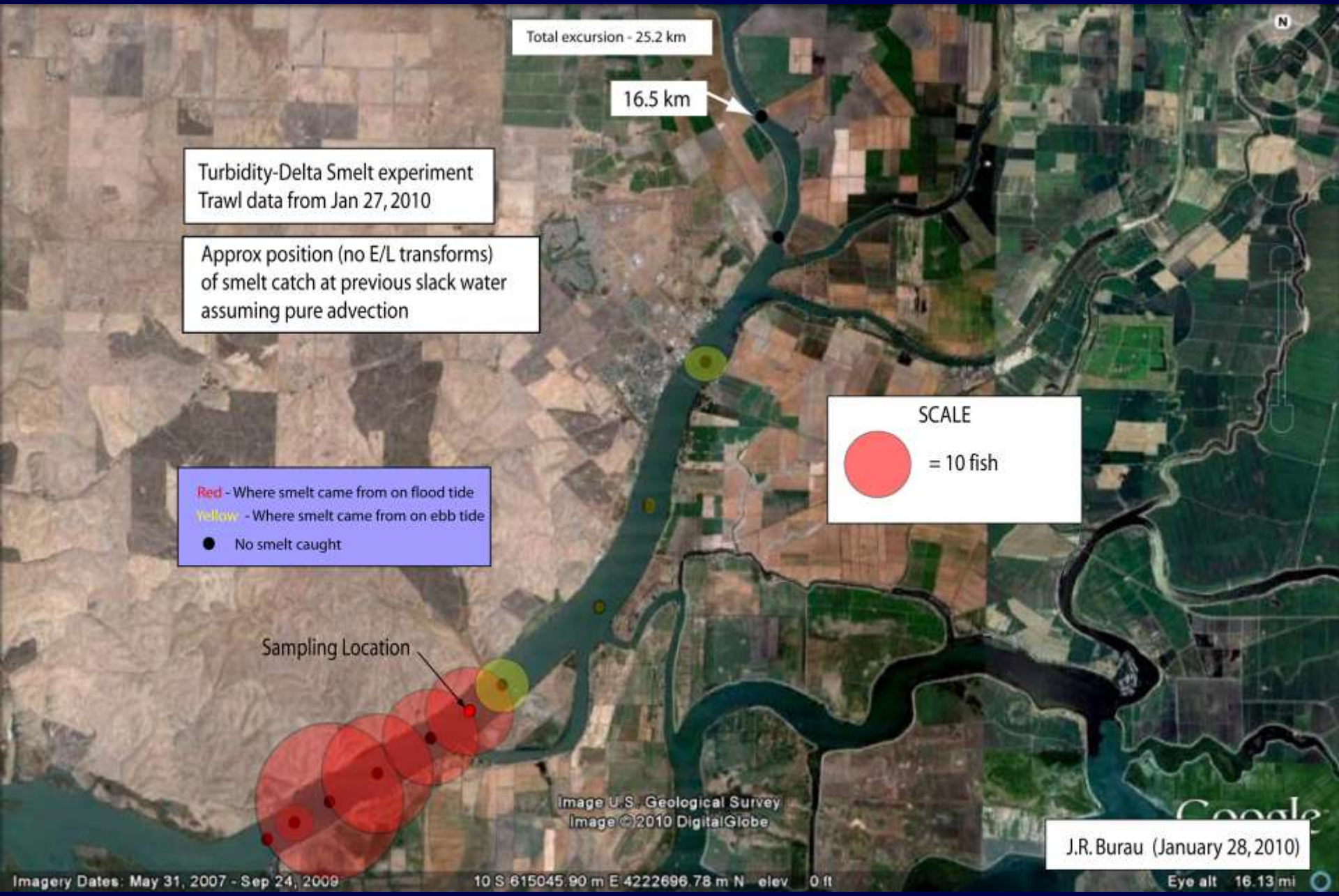


Inferring Spatial Structure from time series data by using the tidal currents

Fisheries data example
January Pilot


1/27/2010
Turbity-Delta Smelt Experiment
Sacramento River near Decker Island
A
Start 8:15 am
Stop 12:15 am
SMELT CATCH
20
10
0
B
TURBIDITY, NTU
140
120
100
80
C
CURRENT SPEED, CM/S
100
80
60
40
20
0
-20
-40
-60
Ebb
Flood
D
EXCURSION, KM
30
20
10
0
-10
25 km
5 km
JRB
27.25
27.30
27.35
27.40
27.45
27.50
27.55
27.60
27.65
27.70
27.75
27.80
27.85
27.90
27.95
28.00
DAYS FROM JANUARY 1, 2010

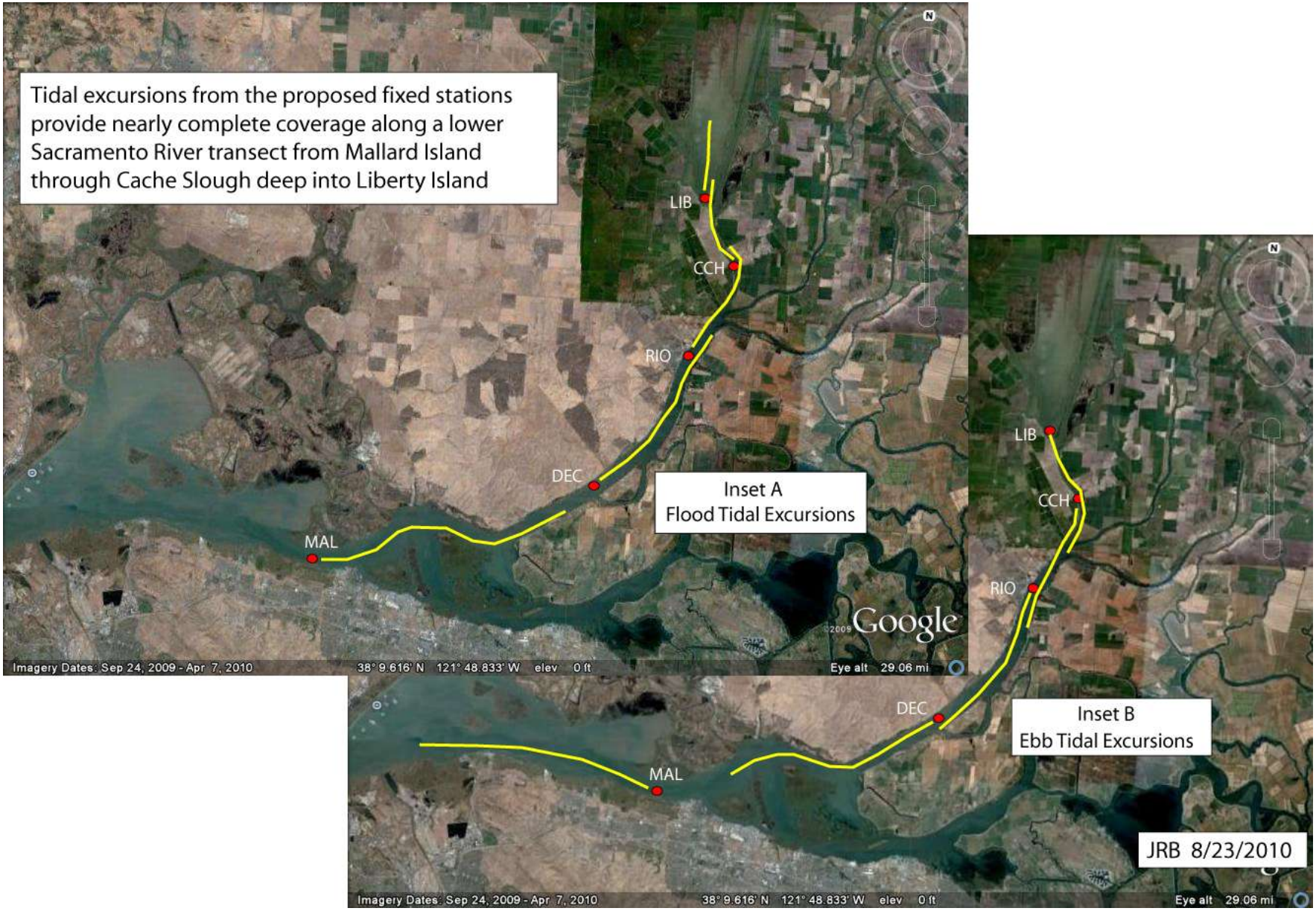
January 27, 2010

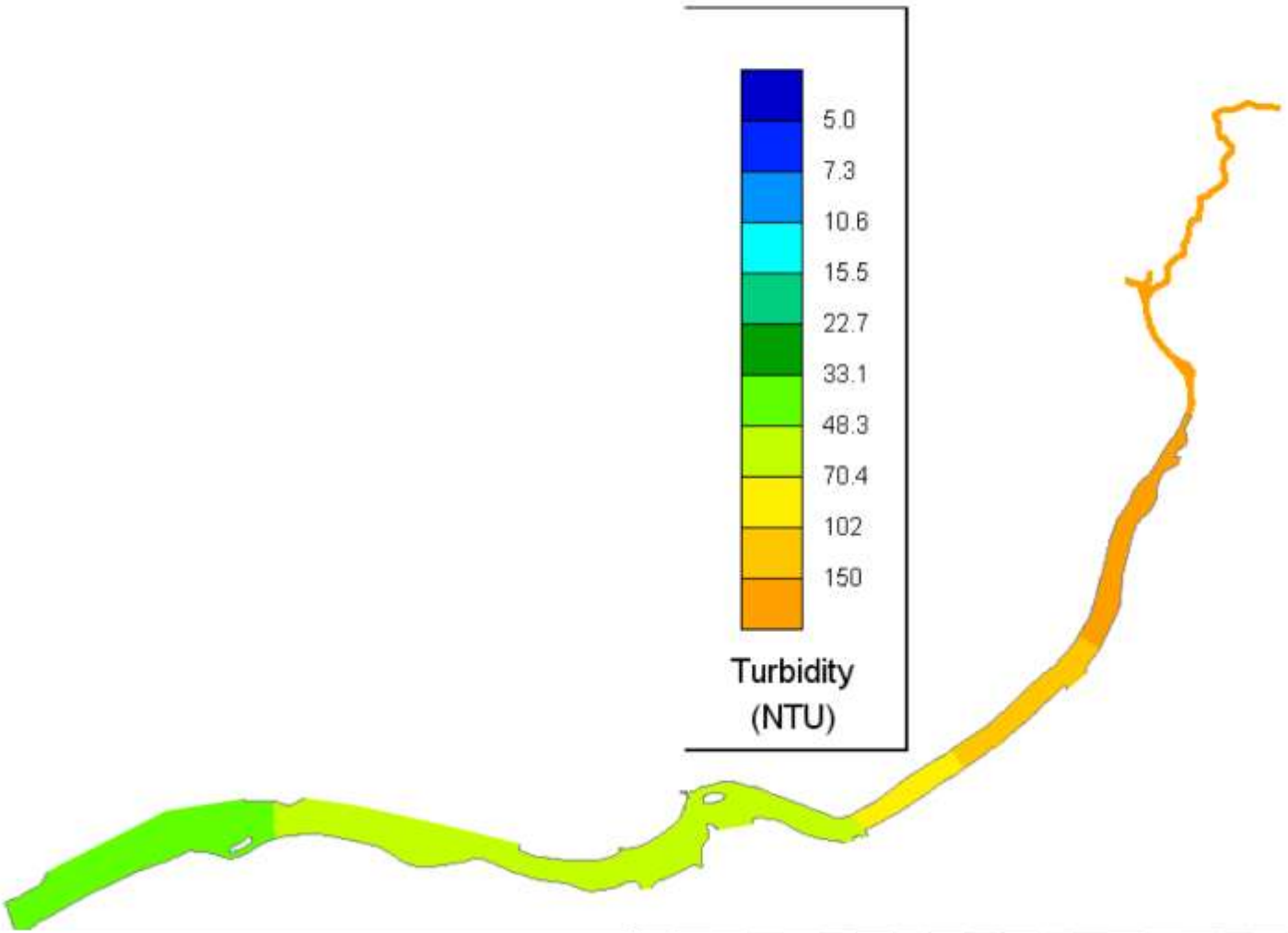


Inferring Spatial Structure from time series data by using the tidal currents

Turbidity Data

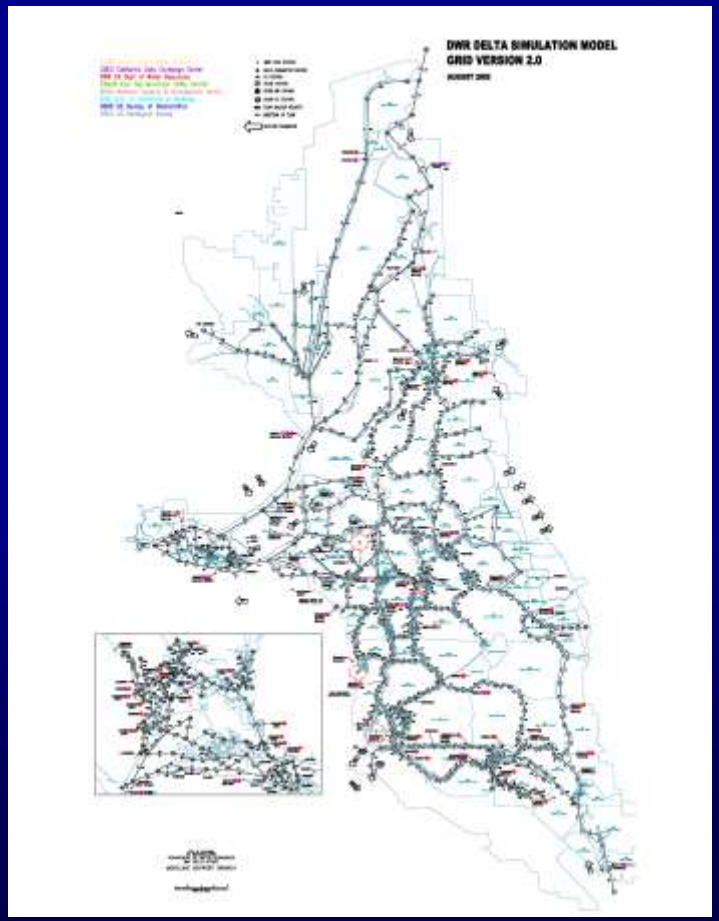
Tidal Excursions of proposed sampling locations




5.0
7.3
10.6
15.5
22.7
33.1
48.3
70.4
102
150
Turbidity
(NTU)

Correlate tides with trawling data?

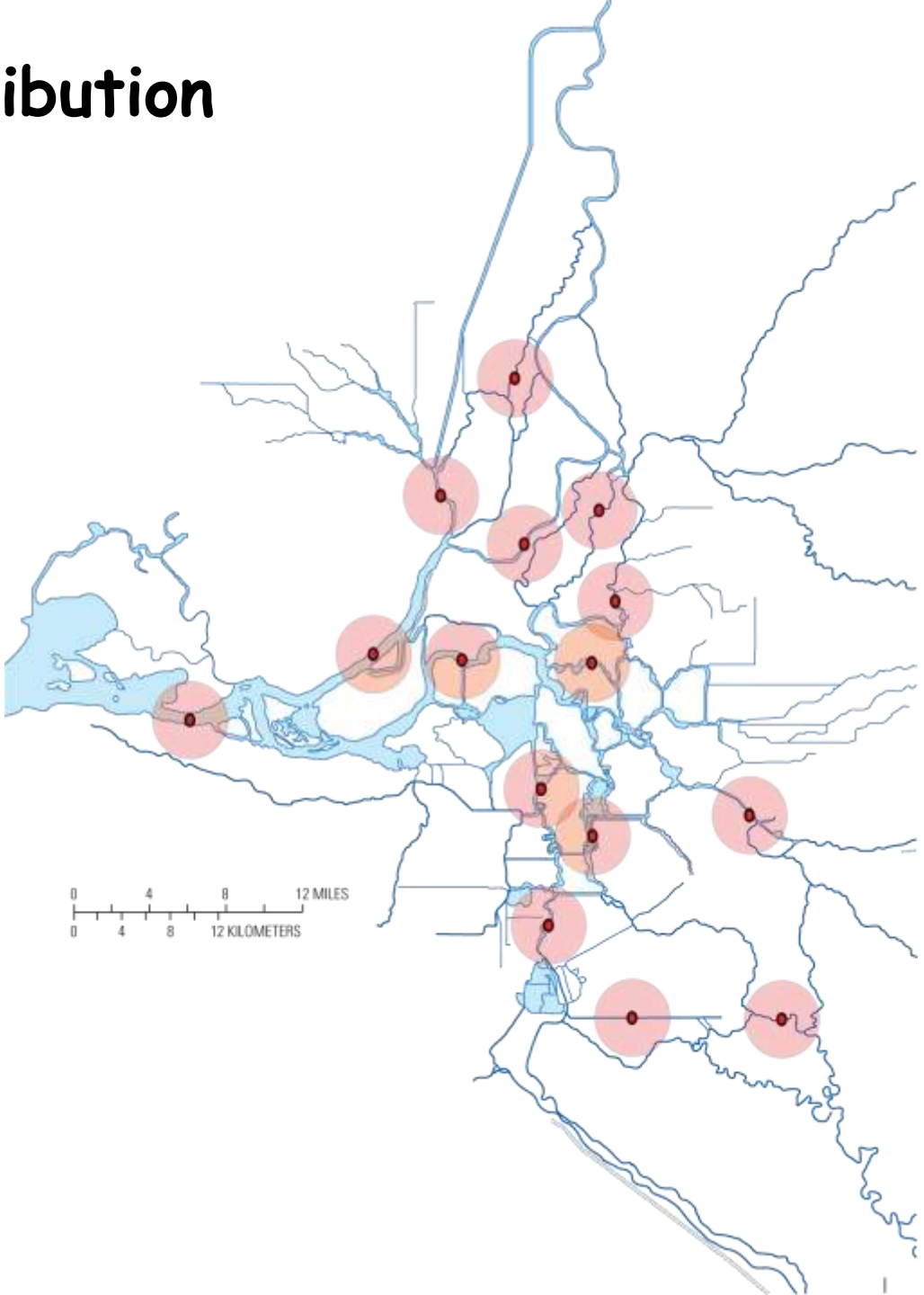
Plan: use historical DSM2 runs to generate estimates of Tidal conditions at the time of sample



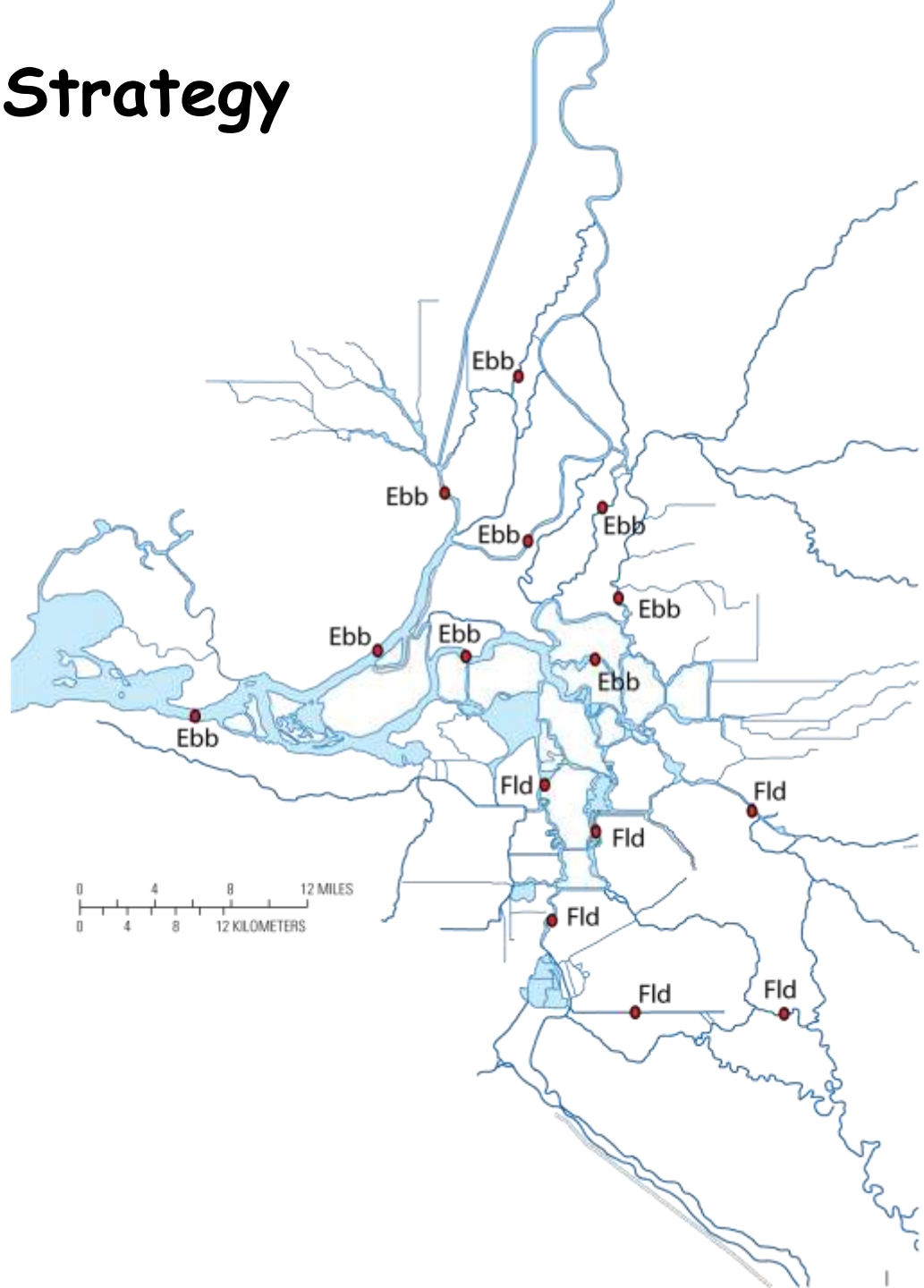
Tidal aliasing

Sampling Irrespective of the tides can create Spurious Spatial Structure

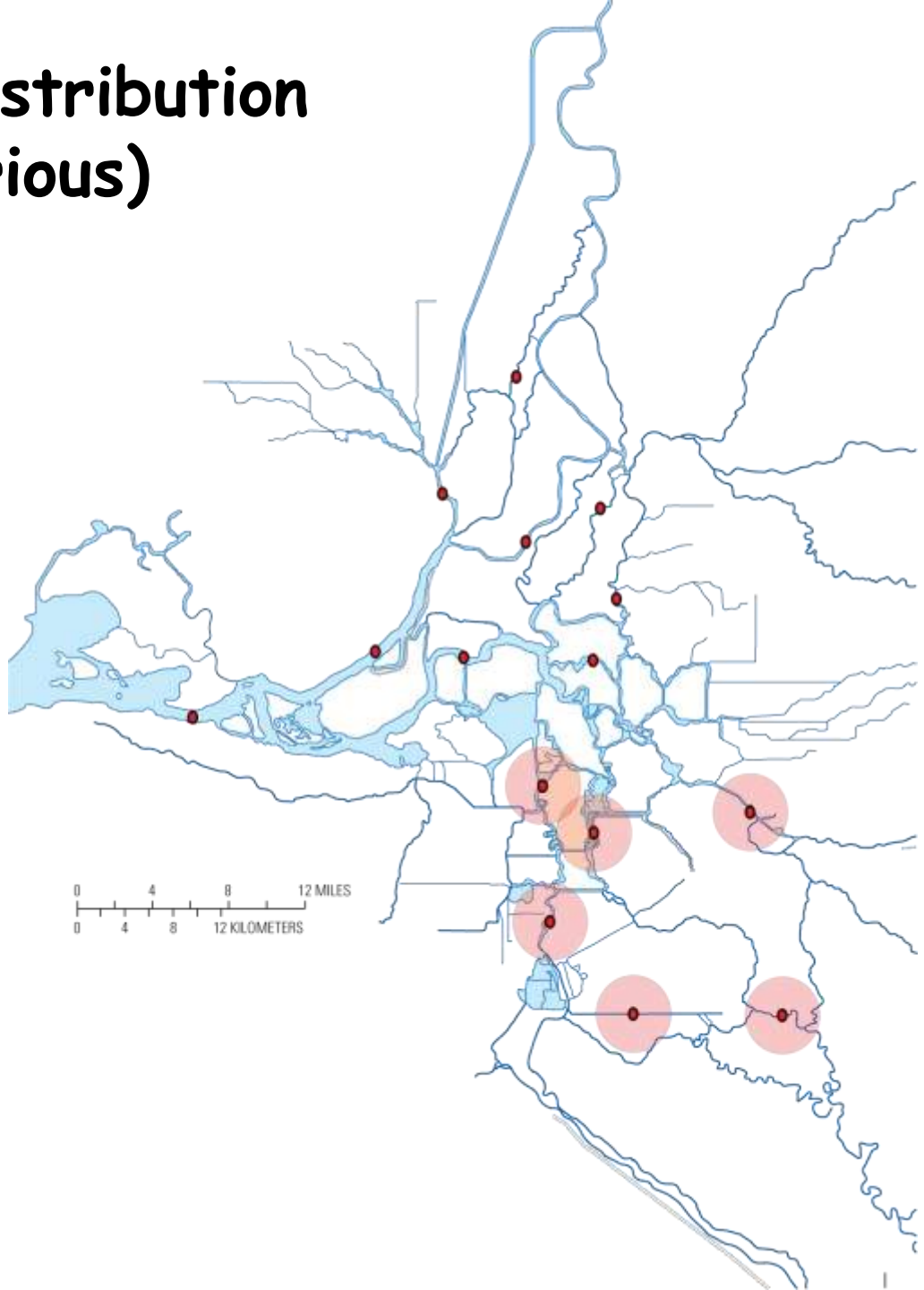
Real Distribution



Sampling Strategy

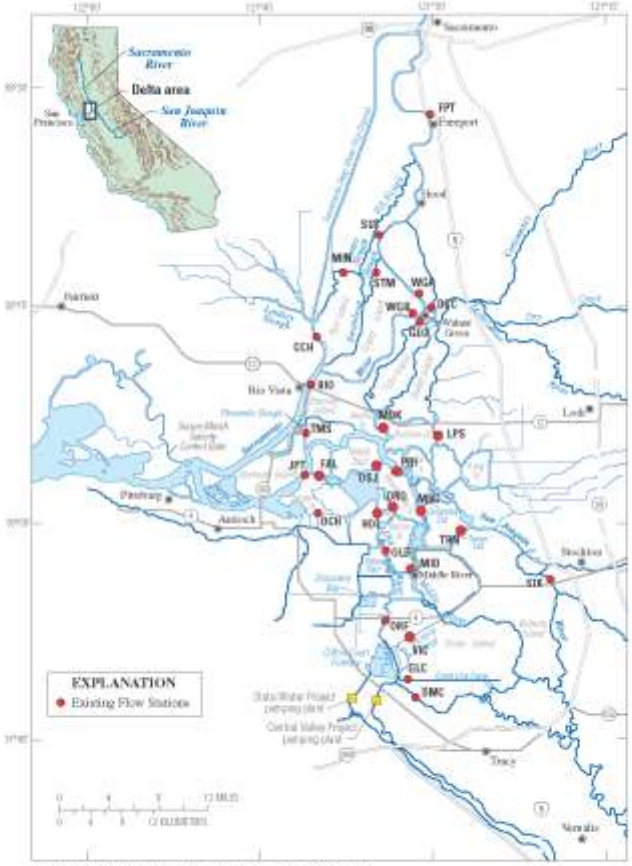


Aliased Distribution (Spurious)



Tidal aliasing solution

Sample adjacent to flow stations
At a particular phase of the tide



Location of flow station sites in the Delta Area of California.


Questions?